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THE STATUS OF THE HIPPOLYTID SHRIMP GENERA *BARBOURIA* AND *LIGUR* (CRUSTACEA: DECAPODA): A REEVALUATION

Raymond B. Manning and C. W. Hart, Jr.

Abstract.—The genera *Barbouria* and *Ligur* are considered to be monotypic. *Parhippolyte* is removed from the synonymy of *Ligur,* and a new genus, *Janicea,* is recognized to receive *Barbouria antiguensis* Chace. These four genera and *Somersiella* comprise a homogeneous grouping of five monotypic genera within the Hippolytidae.

The status and relationships of the hippolytid shrimp genera *Barbouria* Rathbun and *Ligur* Sarato have long puzzled students of these shrimps. Until now, each of these genera contained two species: one in marine and subtidal habitats and one anchialine, confined to land-locked saltwater caves and pools. Holthuis (1963: 272–277) remarked that *Barbouria* resembled *Ligur* "in almost every detail" (p. 272). In features "like the shape of the mandibular palp, with the long last joint, the long and slender legs, the multiarticulate carpus of the second pereiopods and the arrangement of antennal and branchiostegal spines on the carapace, there is the closest resemblance between *Ligur* and *Barbouria*" (p. 277).

Chace (1972) described a second species of *Barbouria.* He remarked (p. 110) that Holthuis' observations were strengthened by the finding of *B. antiguensis,* and concluded "It is possible that *Barbouria* eventually will be relegated to the synonymy of *Ligur* or perhaps that *Barbouria* will revert to its previous monotypic status and that *B. antiguensis* will be transferred to *Ligur.*" In his account, he noted that *B. antiguensis* agrees with *B. cubensis* [and differed from species of *Ligur*] in lacking arthrobranchs on the pereopods, but differs in having the carpus and propodus of the third to fifth pereopods multiarticulate and in having a terminal cluster of coupling hooks on the endopod of the first pleopod of the male. Further, although *Ligur uveae* has prominent arthrobranchs on the pereopods, it agrees with *B. antiguensis* in having a multiarticulate propodus on the walking legs as well as terminal coupling hooks on the endopod of the first male pleopod.

In 1977 Buden and Felder reported that although the coupling hooks are absent in some specimens of *B. cubensis* from Providenciales, they are present in others. They concluded (p. 111) that "The presence of these coupling hooks in both species of *Barbouria* is further evidence that this genus and *Ligur* are closely allied and increases the likelihood that *Barbouria* will eventually be placed in synonymy of *Ligur.*"

The status of the two species assigned to *Ligur* also has been questioned by some authors. *Ligur* was established in 1885 for a deep water species from the Mediterranean, *L. edwardsii* Sarato, a species previously described by Risso (1816) as *Palaemon ensiferus* (see Holthuis 1977:50, for an historical account of this species). A second species, *L. uveae* (Borradaile), originally described in the mono-

typic genus *Parhippolyte* by Borradaile (1899), was transferred to *Ligur* by Kemp (1914:83, 122, 123), without comment. Gordon (1936) presented some observations on the two species of *Ligur,* and commented (p. 102) that "*L. uveae* was first recorded from the Loyalty Islands and briefly described by Borradaile, who, however, omitted to mention that the propodi of the slender walking legs are multiarticulate. This omission was later made good by the same author when he recorded the species from Aldabra in the western Indian Ocean. But he did not mention that, in having the propodi of peraeopods 3–5 segmented, *Ligur uveae* is unique amongst the Caridea."

Monod (1968), in recording additional material of *L. uveae* from the Loyalty Islands, commented on the differences between the two species then assigned to *Ligur,* and remarked (p. 777):

"Bien des détails sont comparables ou identiques chez les 2 espèces, par exemple les pléopodes ♂, mais la différence dans les péréiopodes est très importante (P 3–5 à propode segmenté dans *L. uveae,* simple dans *L. ensiferus*).

"Cette difference est-elle ou non de valeur générique, ou, au moins, sub-générique? Je n'ai pas l'intention d'en décider ici et préfère, pour le moment, suivre l'opinion des divers auteurs (BORRADAILE, KEMP, GORDON, HOLTHUIS) qui ont tenu les deux espèces pour congénériques. Au cas où la multi-articulation du propode P 3–5, unique chez les Crevettes comme le rappelait GORDON (1936), se verrait attribuer une valeur supra-spécifique, le taxon *Parhippolyte* Borradaile, 1900 [sic] reste, évidemment, disponsible.

"Peu après d'ailleurs, CALMAN (1939:210), après avoir signalé la présence de *Ligur edwardsii* dans la région des Maldives, suggérait que *Ligur uveae* pourrait bien être génériquement distinct de *L. edwardsii*; *L. uveae* redeviendrait dans ce cas *Parhippolyte uveae* Borradaile. Je n'ai pas cru pourvoir aller encore jusque là, mais quand les plus nombreux spécimens des deux espèces, *ensiferus* (=*edwardsii*) et *uveae* seront connus, l'éventualité d'une séparation des deux genres est nullement à écarter."

Thus each of these two genera was considered to contain two species, one marine, one anchialine, one with normal walking legs, one with the carpus and/or propodus of the walking legs multiarticulate. In *Barbouria,* the species with multiarticulate walking legs was marine, the other confined to anchialine habitats. In *Ligur* the species with multiarticulate walking legs was anchialine, the other living in the open sea.

The discovery of a fifth species in this complex, described as new by us (Hart and Manning 1981) and assigned to the monotypic genus *Somersiella,* and the subsequent discovery of *Barbouria antiguensis* in a marine cave in Bermuda (Iliffe, Hart, and Manning 1983), has prompted us to reevaluate the species of *Barbouria* and *Ligur* as part of our long-term studies of the anchialine shrimps of Bermuda. We consider the grouping of species in *Barbouria* and *Ligur* to reflect poorly at best the relationships of the four species involved; it seems to us highly unlikely that multiarticulate segments on the walking legs would evolve independently in different members of each of two genera. We have already noted (1981:446) that "We suspect that *B. antiguensis* should be referred to a new genus." In our opinion the multiarticulate walking legs, in combination with other characteristics of the species of *Barbouria, Ligur,* and *Somersiella,* must be considered as generic characters.

Here we present the results of our examination of material of each of these species. We remove *Parhippolyte* from the synonymy of *Ligur,* and we assign *Barbouria antiguensis* to a new genus. Thus, in this complex of closely related shrimps, we recognize five monotypic genera: *Barbouria,* containing only *B. cubensis*; *Janicea,* new genus, containing *Barbouria antiguensis*; *Ligur,* with *L. ensiferus*; *Parhippolyte,* with *P. uveae*; and *Somersiella,* with *S. sterreri.*

Accounts of the Genera

Barbouria Rathbun, 1912

Fig. 1

Barbouria Rathbun, 1912:455. (Type-species *Barbouria poeyi* Rathbun, 1912, a subjective junior synonym of *Hippolyte Cubensis* von Martens, 1872, by original designation and monotypy). Gender feminine.

Habitat.—Anchialine caves and sinks.

Distribution.—Western Atlantic: Cuba, Bahamas, Turks and Caicos Islands, Cayman Brac, and Bermuda (Hobbs, Hobbs, and Daniel 1977; Viña and Dávila 1980; Hart and Manning 1981).

Definition.—Carapace with antennal and branchiostegal spines. Rostrum slender, about 5 times longer than high, but short, extending slightly beyond end of basal segment of antennular peduncle, with 4–7 dorsal (3 postorbital) and 1–4 ventral teeth. Eyes pigmented, cornea narrower than stalk. Anterior 4 abdominal pleura rounded, fifth and sixth with posteroventral corner produced into spine. Telson with 2 pairs of dorsal spines and 3 pairs of terminal spines, middle longest. Epipods (5): present on third maxillipeds and anterior 4 pereopods. Pleurobranchs (5): present on all pereopods. Arthrobranchs (2): on third maxilliped. Podobranch (1): on second maxilliped. Mandible lacking incisor process, with 3-jointed palp. Pereopods 1 and 2 chelate; merus, carpus, and propodus of second leg multiarticulate. Pereopods 3–5 with merus, carpus, and propodus undivided. Endopod of first pleopod of male lacking appendix interna, with or without distal coupling hooks. Endopod of second pleopod of male with appendix masculina shorter than appendix interna.

Janicea, new genus

Fig. 2

Type-species.—*Barbouria antiguensis* Chace, 1972.

Etymology.—We consider it appropriate to dedicate this genus to Janice Chace, who has provided encouragement for her husband, Fenner A. Chace, Jr., throughout a career spanning more than five decades.

Habitat.—Marine, sublittorally on seawalls or in marine caves.

Distribution.—Western Atlantic: Antigua and Bermuda (Chace 1972; Iliffe, Hart, and Manning 1983).

Definition.—Carapace with antennal and branchiostegal spines. Rostrum slender, about 5 times longer than high, but short, extending about to end of basal segment of antennular peduncle, with 3–4 dorsal (1–2 postorbital) and 1 ventral teeth. Eyes pigmented, cornea broader than stalk. Anterior 4 abdominal pleura rounded, fifth acute posteroventrally with posteroventral corner produced into

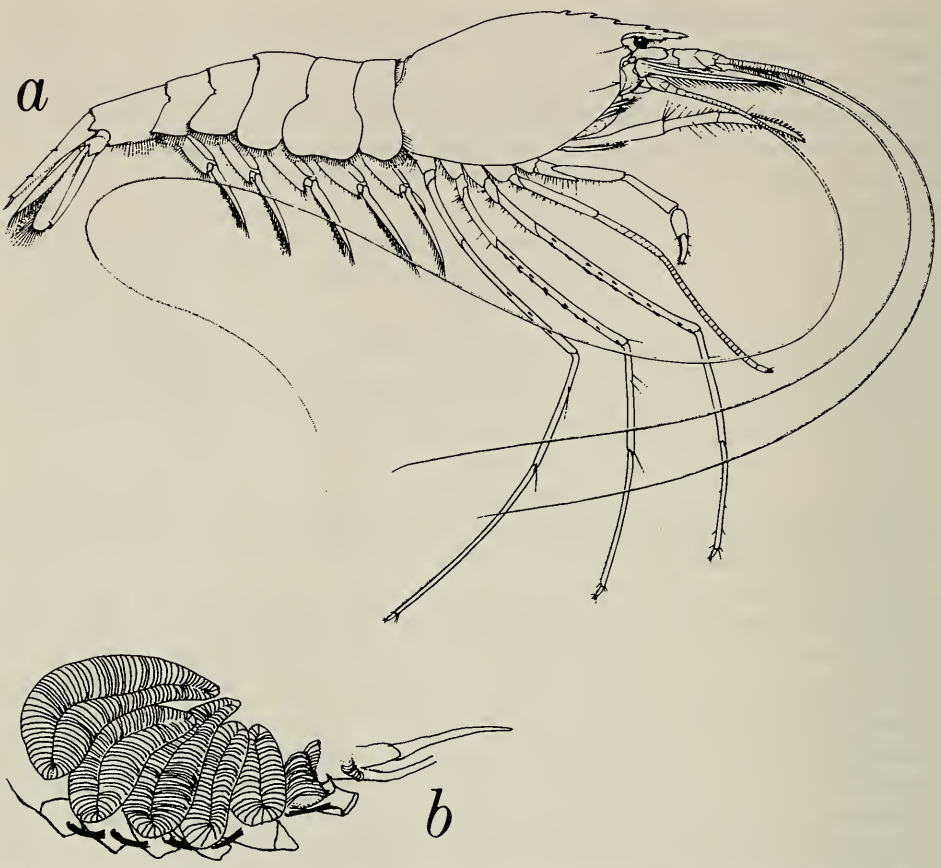

Fig. 1. *Barbouria cubensis* (von Martens): *a,* Animal in lateral view (from Hobbs, Hobbs, and Daniel 1977: fig. 33); *b,* Gill complement (*b* from a specimen from San Salvador, Bahamas, USNM 181659).

sixth spine. Telson with 2 pairs of dorsal spines and 3 pairs of terminal spines, middle longest. Epipods (6): on second and third maxillipeds and anterior 4 pereopods. Pleurobranchs (5): present on all pereopods. Arthrobranchs (2): on third maxilliped. Podobranch (1): on second maxilliped. Mandible lacking incisor process, with 3-jointed palp. Pereopods 1 and 2 chelate; merus, carpus, and propodus of second leg multiarticulate. Pereopods 3–5 with carpus and propodus multiarticulate. Endopod of first pleopod of male without appendix interna but with distal coupling hooks. Endopod of second pleopod of male with appendix masculina longer than appendix interna.

Ligur Sarato, 1885
Fig. 3

Ligur Sarato, 1885:2. (Type-species *Ligur edwardsii* Sarato, 1885, a subjective junior synonym of *Palaemon Ensiferus* Risso, 1816, by monotypy). Gender masculine.

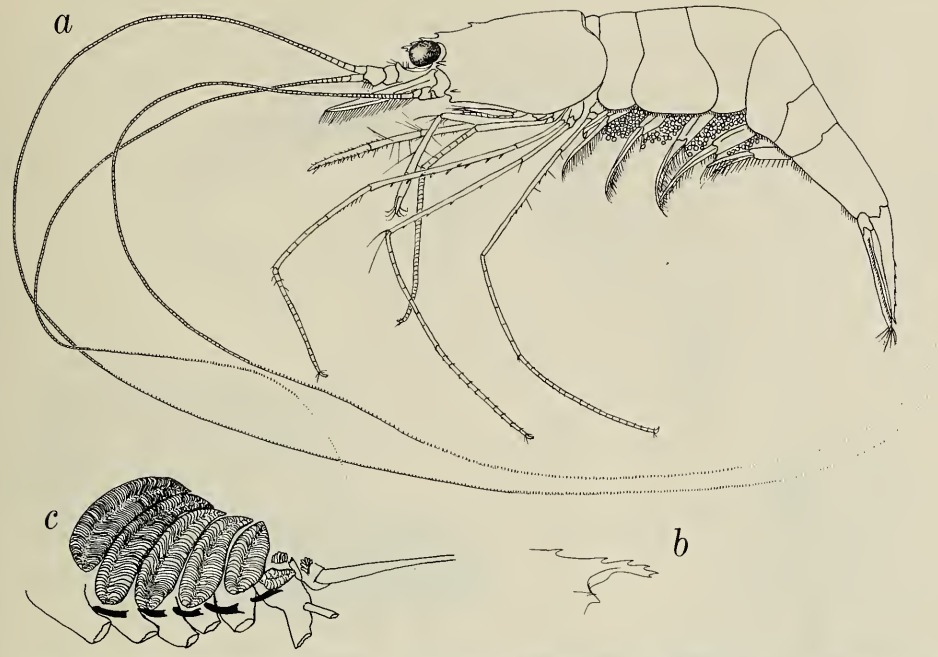

Fig. 2. *Janicea antiguensis* (Chace): *a,* Animal in lateral view; *b,* Rostrum (from Chace 1972: fig. 40*b*); *c,* Gill complement (*a* and *c* from paratypes from Antigua, USNM 135376).

Habitat.—Marine, sublittoral in ca. 300 to 772–860 meters.

Distribution.—Western Indian Ocean, western Mediterranean, northeastern Atlantic off the Cape Verde Islands and Senegal (Crosnier and Forest 1973), and western Atlantic, Cay Sal Bank (Lemaitre 1983).

Definition.—Carapace with antennal and branchiostegal spines. Rostrum slender, length about 5 times depth, long, overreaching antennular peduncle, extending almost to apex of antennal scale, with 3–4 dorsal (1 postorbital) and 4–5 ventral teeth. Eyes pigmented, cornea broader than stalk. Anterior 4 abdominal pleura rounded, pleura of fifth and sixth segments with posteroventral corner produced into spine. Telson with 2 pairs of dorsal spines and 2 pairs of terminal spines, outer longer. Epipods (7): present on all maxillipeds and anterior 4 pereopods. Pleurobranchs (5): present on all pereopods. Arthrobranchs (6): present on third maxilliped (2) and 1 each on anterior 4 pereopods. Podobranch (1): on second maxilliped. Mandible lacking incisor process, with 3-jointed palp. Pereopods 1 and 2 chelate; merus, carpus, and propodus of second leg multiarticulate. Pereopods 3–5 with merus, propodus, and carpus undivided. Structure of endopod of first and second pleopods of male unknown to us.

Parhippolyte Borradaile, 1899
Fig. 4

Parhippolyte Borradaile, 1899: 414. (Type-species *Parhippolyte uveae* Borradaile, 1899, by monotypy). Gender feminine.

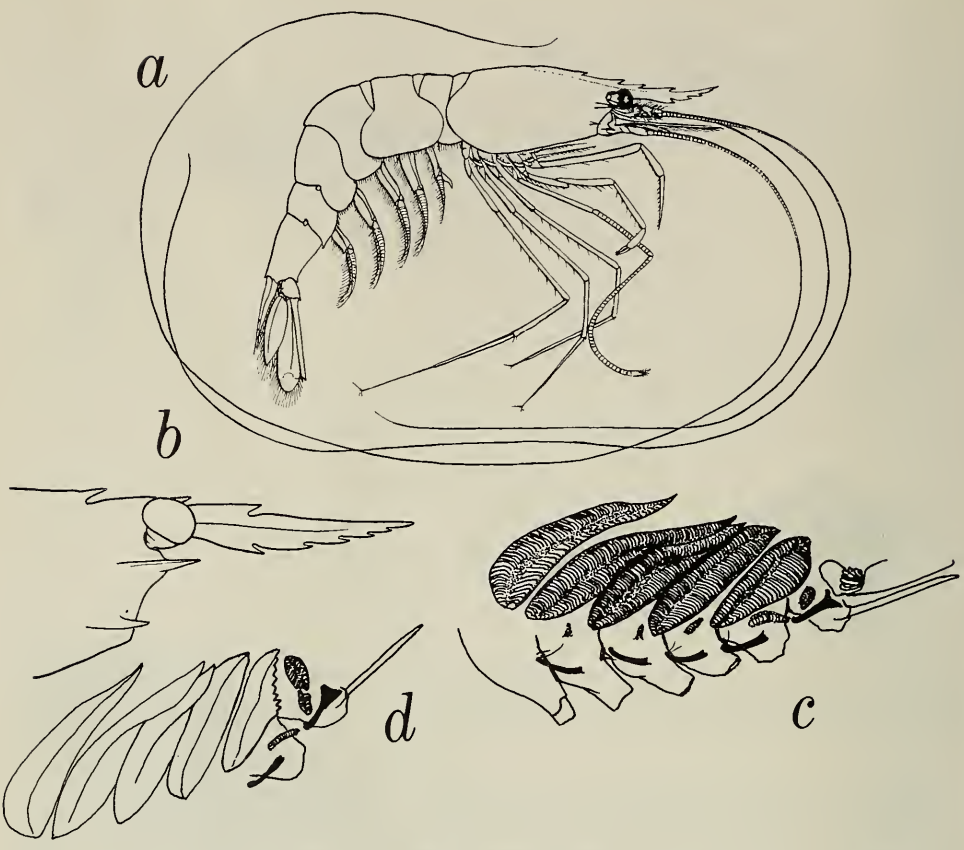

Fig. 3. *Ligur ensiferus* (Risso): *a,* Animal in lateral view (from Senna 1902: pl. 17, fig. 1); *b,* Rostrum (from Gordon 1936: fig. 2a); *c,* Gill complement; *d,* Pleurobranch partly removed to show second arthrobranch on third maxilliped. (*c* and *d* from specimen from Sicily, USNM 152112).

Habitat.—Anchialine pools.

Distribution.—Indo-West Pacific, from scattered localities between western Indian Ocean and Hawaii (Holthuis 1973; Wear and Holthuis 1977; Maciolek 1983).

Definition.—Carapace with antennal and branchiostegal spines. Rostrum broad, length about 2.5 times depth, short, reaching to or beyond base of second segment of antennular peduncle, with 3 dorsal (2 postorbital) and 1–6 ventral teeth. Eyes pigmented, cornea broader than stalk. Anterior 3 abdominal pleura unarmed, pleura of fourth to sixth segments with posteroventral corner produced into spine. Telson with 3 pairs of dorsal spines, 1 subterminal, and 2 pairs of terminal spines, outer longer. Epipods (7): present on all maxillipeds and anterior 4 pereopods. Pleurobranchs (5): present on all pereopods. Arthrobranchs (6): present on third maxilliped (2) and 1 each on anterior 4 pereopods. Podobranch (1): on second maxilliped. Mandible lacking incisor process, with 3-jointed palp. Pereopods 1 and 2 chelate; merus, carpus, and propodus of second leg multiarticulate. Pereopods 3–5 with propodus multiarticulate. Endopod of first pereopod of male without appendix interna but with distal coupling hooks. Endopod of second pleopod of male with appendix masculina shorter than appendix interna.

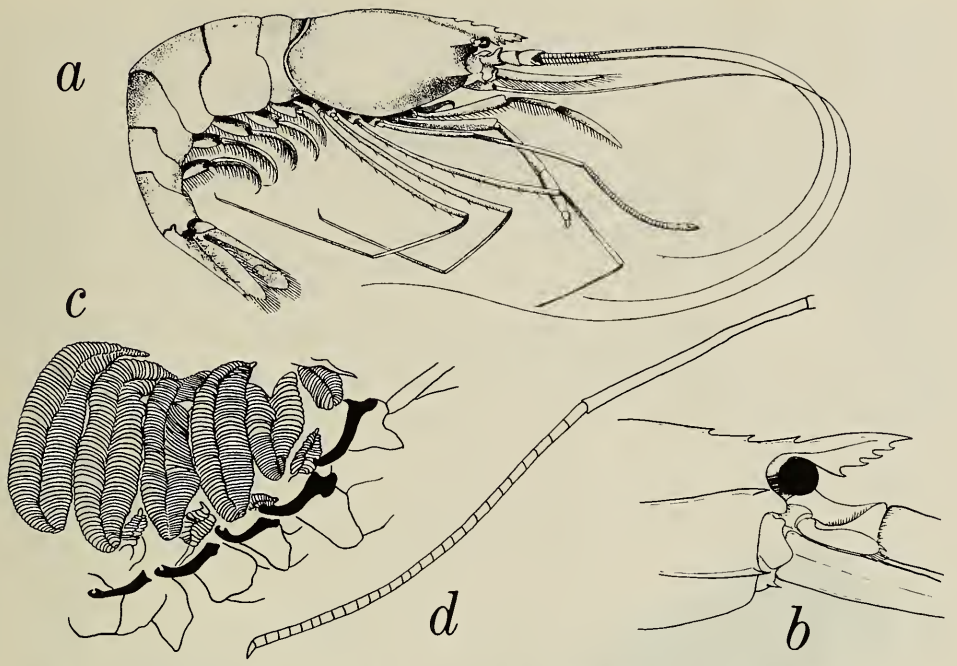

Fig. 4. *Parhippolyte uveae* (Borradaile): *a,* Animal in lateral view (from Borradaile 1899: pl. 38, fig. *11a*; propodi of walking legs erroneously shown to be undivided); *b,* Front (from Monod, 1968: fig. 1); *c,* Gill complement; *d,* Carpus, propodus, and dactylus of fifth pereopod. (*c* and *d* from specimen from Bikini Atoll, USNM 95043).

Somersiella Hart and Manning, 1981
Fig. 5

Somersiella Hart and Manning, 1981:442. (Type-species *Somersiella sterreri* Hart and Manning, 1981, by original designation and monotypy). Gender feminine.

Habitat.—Anchialine caves.

Distribution.—Western Atlantic: Bermuda (Hart and Manning 1981).

Definition.—Carapace with antennal and branchiostegal spines. Rostrum broad, length about 2.5 times depth, short, scarcely overreaching basal segment of antennular peduncle, with 3–4 dorsal (1–2 postorbital) and 4–5 ventral teeth. Eyes pigmented, cornea broader than stalk. Anterior 4 abdominal pleura rounded, fifth with posterolateral spine, sixth armed posterolaterally in female. Epipods (6): present on first and third maxillipeds and anterior 4 pereopods. Pleurobranchs (5): present on all pereopods. Arthrobranchs (7): on second (1) and third (2) maxillipeds and anterior 4 pereopods. Podobranchs absent. Mandible lacking incisor process, with 3-jointed palp. Pereopods 1–2 chelate; merus, carpus, and propodus of second leg multiarticulate. Pereopods 3–5 with propodus multiarticulate. Endopod of first pleopod of male lacking appendix interna, with distal coupling hooks. Endopod of second pleopod of male with appendix masculina subequal in length to appendix interna.

Remarks.—The gill arrangement, summarized below and shown in Figs. 1–5, is different in each genus. All five genera have five pleurobranchs, one on each

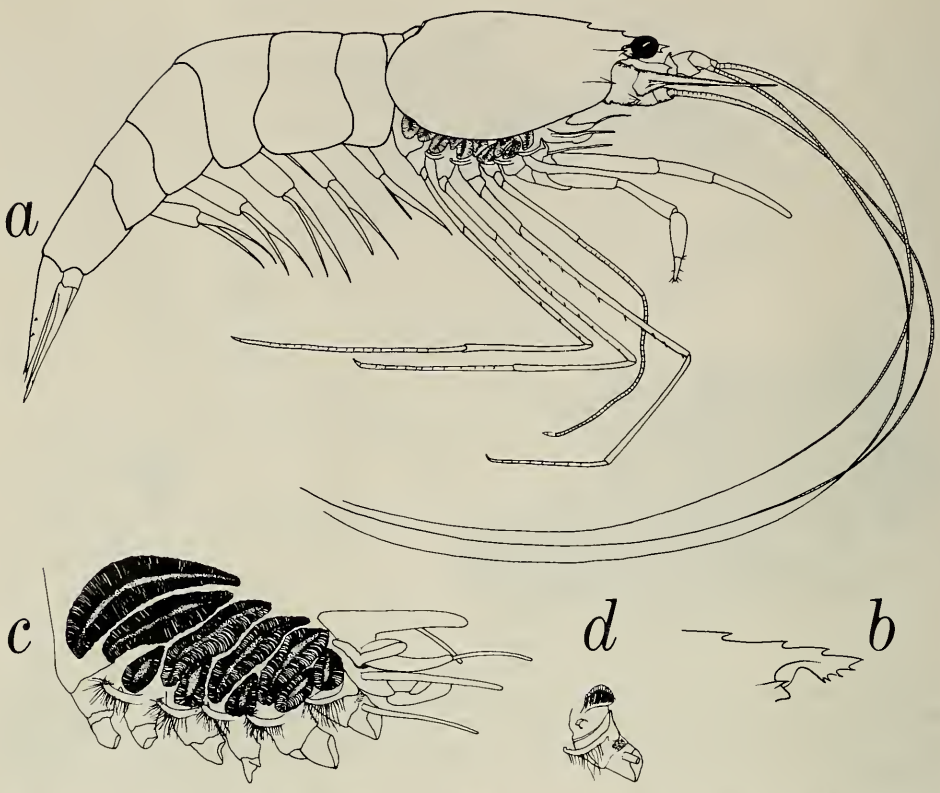

Fig. 5. *Somersiella sterreri* Hart and Manning: *a,* Animal in lateral view; *b,* Rostrum; *c,* Gill complement; *d,* Base of third maxilliped with larger arthrobranch removed to show smaller, more dorsal one. (From Hart and Manning 1981: figs. 1, 2, 4, 5).

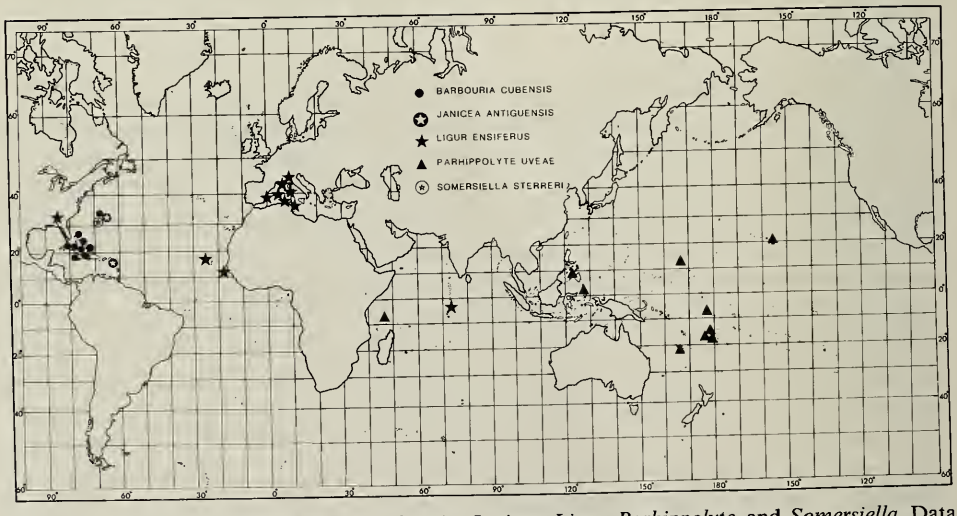

Fig. 6. Distribution of the genera *Barbouria, Janicea, Ligur, Parhippolyte,* and *Somersiella.* Data from: Chace 1972; Crosnier and Forest 1973; Hobbs, Hobbs, and Daniel 1977; Viña and Dávila 1980; Hart and Manning 1981; Iliffe, Hart, and Manning 1983; Lemaitre 1983; Maciolek 1983; and present paper.

pereopod. *Barbouria* and *Janicea* have only two arthrobranchs, both on the third maxilliped, whereas *Ligur* and *Parhippolyte* have six arthrobranchs, two on the third maxilliped, one on each of the anterior four pereopods. In contrast, in *Somersiella* there are seven arthrobranchs, one on the second maxilliped, two on the third, and one on each of the anterior four pereopods. *Somersiella* lacks podobranchs, but the other genera each have one on the second maxilliped. All five genera have epipods on the anterior four pereopods, and also on one or more of the maxillipeds; in *Ligur* and *Parhippolyte* there is an epipod on each maxilliped, in *Somersiella* on the first and third, in *Janicea* on the second and third, and in *Barbouria* on the third.

Overall, the gill complements are as follows (r = reduced):

	Barbouria	*Janicea*	*Ligur*	*Parhippolyte*	*Somersiella*
Epipods	5	6	7	7	6
Pleurobranchs	5	5	5	5	5
Arthrobranchs	2	2	6	6	7
Mxp 1	—	—	—	—	—
Mxp 2	—	—	—	—	1
Mxp 3	2	2	2	2	2
P 1	—	—	r	1	1
P 2	—	—	r	1	1
P 3	—	—	r	1	1
P 4	—	—	r	1	1
P 5	—	—	—	—	—
Podobranchs					
Mxp 2	1	1	1	1	—

We consider other features, especially the subdivision of the carpus and propodus of the walking legs, to be particularly important at the generic level, possibly even more important than the differences in the gill formulas. *Barbouria* and *Ligur* have the carpus and/or the propodus of the walking legs undivided, whereas in the other three genera either the propodus or the carpus and propodus are multiarticulate. In *Barbouria, Janicea,* and *Ligur* the rostrum is slender, about five times longer than high, whereas in *Parhippolyte* and *Somersiella* it is much deeper, about two and one-half times longer than high. The cornea is narrower than the stalk in *Barbouria,* broader in the other four genera. The appendix masculina is shorter than the endopod in *Barbouria* and *Parhippolyte,* subequal to it in *Somersiella,* and longer than the endopod in *Janicea.* The length of the appendix masculina has not been recorded for *Ligur.*

These genera exhibit what we interpret as a Tethyan distribution pattern (Fig. 6). Often in such patterns, the largest number of species occurs in the Indo-West Pacific area. Curiously, four of the five species considered here occur in the western Atlantic, and three are found in Bermudan caves, whereas only one species occurs in the Pacific.

As pointed out by Iliffe, Hart, and Manning (1983), some of the invertebrates frequenting marine caves in Bermuda appear to have affinities with deep-sea organisms. In the group of shrimps reported here, most of which inhabit caves

and anchialine pools, actually interstitial habitats in rock, one of the species, *L. ensiferus,* lives in deep water, on the outer shelf or upper slope.

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Literature Cited

Borradaile, L. A. 1899. On the Stomatopoda and Macrura brought by Dr. Willey from the South Seas.—*In* A. Willey, Zoological Results based on material from New Britain, New Guinea, Loyalty Islands and elsewhere, collected during the years 1895, 1896 and 1897 4:395–428.

Buden, Donald W., and Darryl L. Felder. 1977. Cave shrimps in the Caicos Islands.—Proceedings of the Biological Society of Washington 90(1):108–115.

Calman, W. T. 1939. Crustacea: Caridea.—The John Murray Expedition, 1933–34, Scientific Reports 6(4):183–224.

Chace, Fenner A., Jr. 1972. The shrimps of the Smithsonian Bredin Caribbean Expeditions with a summary of the West Indian shallow-water species (Crustacea: Decapoda: Natantia).—Smithsonian Contributions to Zoology 98:x + 179.

Crosnier, A., and J. Forest. 1973. Les crevettes profondes de l'Atlantique oriental tropical.—Faune Tropicale (O.R.S.T.O.M.) 19, 409 pp.

Gordon, Isabella. 1936. On hippolytid prawns of the genus *Ligur,* Sarato.—Proceedings of the Zoological Society of London 1935–1936:102–108.

Hart, C. W., Jr., and Raymond B. Manning. 1981. The cavernicolous caridean shrimps of Bermuda (Alpheidae, Hippolytidae, and Atyidae).—Journal of Crustacean Biology 1(3):441–456.

Hobbs, Horton H., Jr., H. H. Hobbs III, and Margaret A. Daniel. 1977. A review of the troglobitic decapod crustaceans of the Americas.—Smithsonian Contributions to Zoology 244:v + 183 pp.

Holthuis, L. B. 1963. On red coloured shrimps (Decapoda, Caridea) from tropical land-locked saltwater pools.—Zoologische Mededelingen 38(16):261–279.

———. 1973. Caridean shrimps found in land-locked saltwater pools at four Indo-West Pacific localities (Sinai Peninsula, Funafuti Atoll, Maui and Hawaii Islands), with the description of one new genus and four new species.—Zoologische Verhandelingen 128:1–48.

———. 1977. The Mediterranean decapod and stomatopod Crustacea in A. Risso's published works and manuscripts.—Annales du Muséum d'Histoire Naturelle de Nice 5:37–88.

Iliffe, Thomas M., C. W. Hart, Jr., and Raymond B. Manning. 1983. Biogeography and the caves of Bermuda.—Nature 302(5904):141–142.

Kemp, S. 1914. Hippolytidae. Notes on Crustacea Decapoda in the Indian Museum, V.—Records of the Indian Museum 10:81–129.

Lemaitre, Rafael. 1983. Decapod crustaceans from Cay Sal Bank, Bahamas, with notes on their zoogeographic affinities.—The ASB Bulletin 30(2):66 [abstract].

Maciolek, John A. 1983. Distribution and biology of Indo-Pacific insular hypogeal shrimps.—Bulletin of Marine Science 33(3):606–618.

Monod, Th. 1968. Nouvelle capture de *Ligur uveae* (Borradaile) aux Îles Loyalty (Crustacea, Decapoda).—Bulletin du Muséum National d'Histoire naturelle, Paris (2)40(4):772–778.

Rathbun, Mary J. 1912. Some Cuban Crustacea, with notes on the Astacidae, by Walter Faxon, and a list of the Isopoda, by Harriet Richardson.—Bulletin of the Museum of Comparative Zoology at Harvard College 54(15):449–460.

Risso, A. 1816. Histoire naturelle des crustacés des environs de Nice, 175 pp.
Sarato, C. 1885. Étude sur les crustacés de Nice.—Moniteur des étrangers 222:2.
Senna, Angelo. 1902. Nota sui Crostacei Decapodi. Le esplorazioni abissali nel Mediterraneo del R. Piroscafo Washington nel 1881, II.—Bulletino della Società Entomologica Italiana 34:235–367.
Viña, Nicasio, and Zaida Dávila. 1980. Distribución geográfica de la Barbouria cubensis en Cuba (Crustacea Decapoda Natantia).—*In* Nicasio Viña, editor, Cuevas de Cuba:21–33. Editorial Oriente, Santiago de Cuba.
Wear, Robert G., and L. B. Holthuis. 1977. A new record for the anchialine shrimp *Ligur uveae* (Borradaile, 1899) (Decapoda, Hippolytidae) in the Philippines with notes on its morphology, behaviour and ecology.—Zoologische Mededelingen 51(8):125–140.

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